AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A method, performed by a processor in connection with a memory of a central unit, ~~computer means~~ of evaluating a physical quantity associated with an interaction between a wave and an obstacle[[,]] in a region of three-dimensional space, the method comprising ~~the steps~~:

a) meshing a surface into a plurality of surface samples a part at least of said samples representing a surface of an obstacle receiving a main wave and emitting, in response, a secondary wave, and allocating to each surface sample at least one source emitting an elementary wave representing a contribution to said secondary wave,

b) using a matrix system comprising:

[[-]] an interaction matrix, being invertible, applicable to a given region of space and comprising a number of columns corresponding to a total number of sources, the interaction matrix being stored in a first part of the memory of the central unit,

[[-]] a first column matrix being stored in a second part of the memory of the central unit, each coefficient of said first column matrix being associated with one source and ~~characterizes~~ characterizing the elementary wave that said one source emits,

[[-]] and a second column matrix, obtainable by multiplication, by the processor, of the first column matrix by the interaction matrix and being stored in a third part of the memory of the central unit, each coefficient of said second column matrix being values of a physical quantity ~~(V(M))~~ representative of the wave emitted by all of the sources of said given region ~~(M)~~,

and using the matrix system a first time for:

c) assigning chosen values of said physical quantity to predetermined points, each of said predetermined points being associated with a surface sample, placing said chosen values in the second column matrix, applying the interaction matrix to said predetermined points, and estimating the coefficients of said first column matrix by multiplication of said second column matrix by the inverse of the interaction matrix determined for said predetermined points; and

~~at~~ using the matrix system at least a second time for:

d) applying the interaction matrix to a chosen region of three-dimensional space, multiplying the first column matrix comprising the coefficients estimated in step c) by said interaction matrix determined for said chosen region, to evaluate coefficients of said second column matrix;

wherein the coefficients of said second column matrix, evaluated in step d), corresponding to values of said physical quantity representing the secondary wave emitted by the obstacle, in said region of three-dimensional space, each of said predetermined points associated with a surface sample corresponding to a point of contact between said surface sample and a hemisphere, said hemisphere:

having a surface equal to the surface of said surface sample, and

including said at least one source allocated to said surface sample,

wherein:

[[-]] the surface of the obstacle corresponds to an interface between a first medium and a second medium, said main wave propagating in said first medium,

[[-]] and said hemisphere is oriented:

inwardly for a propagation of said secondary wave in said second medium, and

outwardly for a propagation of said secondary wave in said first medium.

2. (Previously Presented) The method according to Claim 1, wherein, to evaluate a physical quantity representative of an interaction between an element radiating a main wave and an obstacle receiving this main wave,

- in step a), a plurality of surface samples together representing an active surface of the element radiating the main wave is furthermore determined, by meshing, and at least one source emitting an elementary wave representing a contribution to said main wave is allocated to each sample of the active surface,

- steps b), c) and d) are furthermore applied to the samples of the active surface, and

- said physical quantity representing the interaction between the radiating element and the obstacle in a given region of three-dimensional space is evaluated by taking account of the contribution, in said chosen region, of the main wave emitted by the sources of the active surface and the contribution of the secondary wave emitted by the sources of the surface of the obstacles.

3. (Previously Presented) The method according to Claim 1, wherein each coefficient of the interaction matrix, applied to a given region of space, is representative of an interaction between a source and said given region and the value of each coefficient is dependent on a distance between a source and said given region.

4. (Previously Presented) The method according to Claim 1, wherein the interaction matrix applied, in step c), to said predetermined points comprises a number of rows corresponding to a total number of predetermined points.

5. (Previously Presented) The method according to Claim 1, wherein the physical quantity to be evaluated is a scalar quantity and, in step a), a single source is allocated to each surface sample.

6. (Previously Presented) The method according to Claim 5, wherein the interaction matrix applied, in step d), to the chosen region of space comprises a single row.

7. (Currently Amended) The method according to Claim 5, wherein each predetermined point associated with a surface sample ~~(dS_i)~~ corresponds to a point of contact between this surface sample and a hemisphere having:

a surface equal to the surface of said surface sample, and

a centre corresponding to a position of the source allocated to said surface sample.

8. (Previously Presented) The method according to Claim 5, wherein:

- the main wave is an electric wave,
- the coefficients of the first column matrix are values of electric charge, ~~that are~~ each of said values being associated with a source, and
- the coefficients of the second column matrix are values of electric potential.

9. (Previously Presented) The method according to Claim 5, wherein:

- the main wave is a magnetic wave,
- the coefficients of the first column matrix are values of magnetic flux, each of said values being associated with a source, and
- the coefficients of the second column matrix are values of magnetic potential.

10. (Previously Presented) The method according to Claim 5, wherein:

- the main wave is a sound wave,
- the coefficients of the first column matrix are values of speed of sound, ~~that are~~ each of said values each associated with a source, and
- the coefficients of the second column matrix are values of acoustic pressure.

11. (Previously Presented) The method according to Claim 1, wherein the physical quantity to be evaluated is a vector quantity expressed by three coordinates in three-dimensional space, and three sources are allocated, in step a), to each surface sample.

12. (Currently Amended) The method according to Claim 11, wherein the interaction matrix applied, in step d), to a region of space ~~(M)~~ comprises a row for each space coordinate.

13. (Previously Presented) The method according to Claim 11, wherein:

- the three sources allocated to each surface sample are substantially in ~~one and~~ the same plane, and
- each predetermined point associated with a surface sample corresponds to a point of contact between this sample and a hemisphere having

  a surface equal to the surface of said sample, and

  a centre corresponding to the position of a barycentre of said three sources.

14. (Previously Presented) The method according to Claim 13, wherein the three sources of each same surface sample form substantially an equilateral triangle, and the triangles of the surface samples are oriented substantially randomly with respect to one another.

15. (Previously Presented) The method according to Claim 11, wherein:

- the main wave is an electric wave,
- the coefficients of the first column matrix are values of electric charge, each value being associated with a source, and
- the coefficients of the second column matrix are values of coordinates of an electric field.

16. (Previously Presented) The method according to Claim 11, wherein:

- the main wave is a magnetic wave,
- the coefficients of the first column matrix are values of magnetic flux, each value being associated with a source, and
- the coefficients of the second column matrix are values of coordinates of a magnetic field.

17. (Previously Presented) The method according to Claim 11, wherein:

- the main wave is a sound wave,
- the coefficients of the first column matrix are values of speed of sound, each value being associated with a source, and
- the coefficients of the second column matrix are values of coordinates of an acoustic velocity.

18. (Previously Presented) The method according to claim 1, wherein:

the secondary wave corresponds to a reflection of the main wave on the obstacle,

the hemisphere is oriented outwards from the obstacle, and

to estimate the contribution of the secondary wave in said given region in step d), said values of physical quantity chosen in step c) are dependent on a predetermined coefficient of reflection of the main wave by each surface sample of the obstacle.

19. (Previously Presented) The method according to Claim 1, wherein:

the secondary wave corresponds to a reflection of the main wave in the obstacle,

the hemisphere is oriented inwards into the obstacle, and

to estimate the contribution of the secondary wave in said chosen region in step d), said values of physical quantity chosen in step c) are dependent on a predetermined coefficient of transmission of the main wave by each surface sample of the obstacle.

20. (Currently Amended) The method according to Claim 2, ~~taken in combination with Claim 18~~ wherein the secondary wave corresponds to a reflection of the main wave on the obstacle,

the hemisphere is oriented outwards from the obstacle, and

to estimate the contribution of the secondary wave in said given region in step d), said values of physical quantity chosen in step c) are dependent on a predetermined coefficient of reflection of the main wave by each surface sample of the obstacle, and further wherein the values associated with the sources of the radiating element are determined and, in said matrix system, are formed at least:

a first interaction matrix representing the contribution of the sources of the obstacle to the predetermined points of the surface of the obstacle,

a second interaction matrix representing the contribution of the sources of the radiating element to the predetermined points of the surface of the obstacle,

a reflection matrix, comprising coefficients representing coefficients of reflection at each predetermined point of the obstacle,

to determine the values of the sources of the obstacle as a function of the values of the sources of the radiating element and of a multiplication of the first and second interaction matrices and of the reflection matrix.

21. (Currently Amended) The method according to Claim 2, ~~taken in combination with Claim 19~~; wherein, the secondary wave corresponds to a reflection of the main wave in the obstacle,

the hemisphere is oriented inwards into the obstacle, and

to estimate the contribution of the secondary wave in said chosen region in step d), said values of physical quantity chosen in step c) are dependent on a predetermined coefficient of transmission of the main wave by each surface sample of the obstacle, and further wherein

in step c), the values associated with the sources of the radiating element are determined and, in said matrix system, are formed at least:

[[-]] a first interaction matrix representing the contribution of the sources of the obstacle to the predetermined points of the surface of the obstacle,

[[-]] a second interaction matrix representing the contribution of the sources of the radiating element to the predetermined points of the surface of the obstacle,

[[-]] a transmission matrix comprising coefficients representing coefficients of transmission at each predetermined point of the obstacle,

to determine the values of the sources of the obstacle as a function of the values of the sources of the radiating element and of a multiplication of the first and second interaction matrices and of the transmission matrix.

22. (Previously Presented) The method according to Claim 2, wherein, in step c), the values associated with the sources of the radiating element are determined by taking account of the reception of the secondary wave by the radiating element and by furthermore formulating:

- a third interaction matrix representing the contribution of the sources of the obstacle to the predetermined points of the surface of the radiating element,
- and a fourth interaction matrix representing the contribution of the sources of the radiating element to the predetermined points of the surface of the radiating element.

23. (Previously Presented) The method according Claim 19, wherein the surface of the obstacle corresponds to an interface between two distinct media of a heterostructure.

24. (Previously Presented) The method according to Claim 1, wherein the main wave is a sound wave and the coefficients of the interaction matrix are each dependent on an angle of incidence of an elementary wave emanating from a source in said given region.

25. (Previously Presented) The method according to Claim 7, wherein, for each surface sample, the value of a scalar product is tested of:

- a first vector normal to the surface sample and directed towards the apex of the hemisphere, and
- a second vector drawn between a source associated with this hemisphere and said given region,

while distinguishing:

- the case where this scalar product is less than a predetermined threshold and the contribution of this source is not taken into account, and
- the case where this scalar product is greater than a predetermined threshold and the contribution of this source is actually taken into account.

26. (Previously Presented) The method according to Claim 1, wherein the main wave is a sound wave and, in step a), a total number of surface samples is chosen substantially as a function of a wavelength of the sound wave so as to satisfy the Rayleigh criterion.

27. (Previously Presented) The method according to Claim 1, wherein a plurality of values of the physical quantity estimated in step d), which are obtained for a plurality of regions of space, are compared so as to select a candidate region for the placement of a radiating element intended to interact with the obstacle.

28. (Previously Presented) The method according to Claim 2, wherein the radiating element is a sensor, for nondestructive testing, intended for analysing an object forming an obstacle of the main wave.

29. (Currently Amended) A computer program product, stored in a central unit memory or on a removable support able to cooperate with a reader of this central unit, intended to be run by a processor of said central unit for evaluating a physical quantity associated with an interaction between a wave and an obstacle, in a chosen region of three-dimensional space, wherein the computer program product comprises instructions for:

a) meshing a surface into a plurality of surface samples, a part at least of said samples representing a surface of an obstacle receiving a main wave and emitting, in response, a secondary wave, and allocating to each surface sample at least one source emitting an elementary wave representing a contribution to said secondary wave,

b) using a matrix system comprising:

[[-]] an interaction matrix, being invertible, applicable to a given region of space and comprising a number of columns corresponding to a total number of sources, <u>the interaction matrix being stored in a first part of the memory of the central unit,</u>

[[-]] a first column matrix <u>being stored in a second part of the memory of the central unit</u>, each coefficient of said first column matrix being associated with one source and ~~characterizes~~ <u>characterizing</u> the elementary wave that said one source emits,

[[-]] and a second column matrix <u>being stored in a third part of the memory of the central unit</u>, which is obtained by multiplication of the first column matrix by the interaction matrix, each coefficient of ~~of~~ said second column matrix being values of a physical quantity representative of the wave emitted by all the sources in said given region,

using the matrix system a first time for:

c) assigning chosen values of said physical quantity to predetermined points, each of said predetermined points being associated with a surface sample, placing said chosen values in the second column matrix, the interaction matrix to said predetermined points,

and using the matrix system at least a second time for:

d) applying the interaction matrix to a chosen region of three-dimensional space,

multiplying the first column matrix comprising the coefficients estimated in step c) by said interaction matrix determined for said chosen region, to evaluate coefficients of said second column matrix,

~~d)~~ <u>e)</u> the coefficients of said second column matrix, evaluated in step d), corresponding to values of said physical quantity representing the wave emitted by the obstacle in said chosen region of three-dimensional space, each of said predetermined points

associated with a surface sample corresponding to a point of contact between said surface sample and a hemisphere, said hemisphere:

having a surface equal to the surface of said surface sample, and

including said at least one source allocated to said surface sample,

wherein:

the surface of the obstacle corresponds to an interface between a first medium where said main wave propagates, and a second medium,

and said hemisphere is oriented:

inwardly for a propagation of said secondary wave in said second medium, and

outwardly for a propagation of said secondary wave in said first medium.